

CONGRATULATING THE CITY OF PLYMOUTH, MINNESOTA

• Ms. KLOBUCHAR. Mr. President, I wish to congratulate the city of Plymouth, MN, for being named the "Best City in America" by the staff and writers of Money Magazine.

Because of this recognition, the country now knows what the residents of Plymouth, MN, have already known: that Plymouth is an exceptional place to live and grow, rich in culture and character.

The median household costs of single family homes in Plymouth allow families to responsibly purchase homes that are appropriate to their needs. When looking for educational or entertainment opportunities though, residents of Plymouth have access to a wide array of events at the Hilde Performance Center and other entertainment venues, as well as 40 public parks, 100 miles of trails, and half a dozen large lakes to swim, fish, and run around. With over 104 libraries within 15 miles, it is no surprise that the Plymouth public school system is ranked among the top three districts in a State renowned for education leadership. There are also 27 colleges, universities, and professional schools within a few miles of the city, exemplifying why 83 percent of Plymouth's citizens attended college.

Plymouth is not only the best city in America because of its proximity to arts, education, and the outdoors, it is also home to a healthy and thriving economy and active local government. The 50,000 jobs created in the city of Plymouth aids in independent business development, low crime rates, and allows for greater access to health care options, so critical to Plymouth's low rates of diabetes and hypertension. Plymouth's local government recently led an effort to have a "green roof" and rain gardens installed when City Hall was expanded, thereby reducing greenhouse gases and mitigating the impact of pollution through water runoff.

Acknowledging this city's many successes, today I encourage other communities to follow the lead of Plymouth, MN, and encourage business leadership, civic investment, and community cohesiveness through its commerce, government, schools, entertainment, and health care initiatives.●

TRIBUTE TO TOM J. MORRIS

• Ms. LANDRIEU. Mr. President, I would like to take a few minutes to reflect upon the memory of Tom J. Morris, a true hero to the men and women of Louisiana. Tom died while traveling on vacation with his wife Denise in Boston last Friday morning. As an individual who shares his commitment to civil service and the State of Louisiana, I wanted to honor his truly inspiring career. For the last 19 years, Tom was the CEO for the United Way of Southwest Louisiana, Inc., in Lake Charles. In sum, he had a combined 30

years of service with the United Way and was considered a leader in the community of Lake Charles, particularly in the wake of Hurricanes Katrina and Rita. As you know, United Way is a nonprofit organization dedicated to nurturing the future generations and youth of the United States. Tom Morris was a man who represented the convictions of this Nation's youth, by bringing together communities and organizations in order to solve today's dilemmas. Louisiana is still in the wake of the hurricanes, and his dedicated assistance to victims, as well as the general community, will be sorely missed. His efforts to inspire young volunteers and assist in hurricane recovery are still considered vital to the reconstruction of local communities in Louisiana. To his family and his wife Denise, I extend my condolences and my prayers. Tom Morris's efforts are truly inspirational and will always be remembered, not only by the men and women of southwest Louisiana but by also by the Nation as a whole.●

ANIVERSARY OF THE DITCHLEY FOUNDATION

• Mr. LUGAR. Mr. President, I am pleased to have the opportunity to pay tribute to the work of the Ditchley Foundation on the occasion of the 50th anniversary of its founding.

Since the foundation's inception in 1958, several of my colleagues, on both sides of the aisle and in both Chambers of the Congress, have taken part in the conferences held at Ditchley Park. This beautiful 18th century country house a few miles outside of Oxford, England, was used as a weekend retreat by Prime Minister Winston Churchill and Averill Harriman, then U.S. Ambassador to Great Britain, during the frequent bombings of London during World War II. Today, Ditchley Park is home to around a dozen conferences each year on topics of relevance to transatlantic relations and international policy concerns in general. This series includes a keynote annual address given by a distinguished lecturer every summer.

This year's lecture gathering was especially noteworthy during this anniversary year. Individuals from a number of fields and countries attended, including our former colleague in the House of Representatives, now president emeritus of New York University, Dr. John Brademas. Dr. Brademas is himself a trustee of the Ditchley Foundation and was for several years chairman of the American Ditchley Foundation.

The current chairman is Rita E. Hauser, president of the Hauser Foundation and a former member of the President's Foreign Intelligence Advisory Board. Further, the executive director of American Ditchley is John J. O'Conner, vice chancellor and secretary of the State University of New York.

At the annual lecture on July 11, 2008, chairman of the Ditchley Founda-

tion and former Prime Minister of the United Kingdom John Major made the following introductory remarks, which I would like to share with my colleagues. I ask to have the remarks printed in the RECORD.

The material follows.

"Ditchley is one of the hidden gems of the Transatlantic relationship.

It doesn't feature in Presidential speeches or Prime Ministerial briefing. Mercifully, it is not a plaything of the media; but its role as a clearing house for ideas; a forum for debate and discussion; and a magnet for policymakers gives it a unique status. It is the intellectual expression of 'soft power' and a tribute to the pre-eminence of reason and rational debate.

Of course—you all know that: it is why you are here. All of you know Ditchley, are committed to Ditchley, care about its future and have contributed generously to ensure it. For that—I thank you most warmly; it is a delight to see you all here this evening. My only regret is that many others—who also care for Ditchley and have been enormously generous to it—could not be here to join us. In their absence, I thank them, too, for all their support.

On Ditchley's 50th Anniversary, I think it worthwhile to look at its role.

My father was half-American. Brought up in the United States he drilled into me as a boy the importance of the Transatlantic relationship. His affection for it was emotional—but the economic, political and military case is even stronger. And yet we cannot take this for granted; it is not necessarily a fixed star in the firmament. Geography hugs Britain to her neighbors in Europe, and so does trade.

Trade and real politik turn American eyes to the East: there is no room for complacency. The most successful alliance in history is not immutable. It needs cherishing to keep it in good order.

Ditchley plays a role in this. And why is that? It is, of course, because thoughtful minds—lifting debate from the ephemeral to the eternal—see the importance (and the self-interest if you like) of nurturing Transatlantic ties.

But there is a further reason why Ditchley plays a role—a more prosaic reason. It is because one man saw the importance of the subject and had the vision to establish Ditchley in order to do something about it. That man was David Wills. Today, we remember and honour his vision, his commitment and his generosity. He saw the need—forgive the unintended pun—and he willed the means. David Wills is the Father of Ditchley and the effect of his invisible hand is evident in the continuing and instinctive relationship of trust that we take for granted across the Atlantic.

He chose wisely, too, in entrusting his legacy to Lady Wills and Catherine Wills. No one could have cared for Ditchley more, and their generosity has always been outstanding. I don't simply mean generosity in material terms—though certainly that, for the Wills family were by far the largest contributors to our recent fundraising campaign—but also their personal commitment in time and involvement. They are the living embodiment of Ditchley. I believe they can be satisfied that their actions have helped bind the ties that keep us safe and prosperous.

Following Sir John's remarks, the annual lecture was delivered by an eminent British scholar and scientist, Professor Martin Rees, a member of the House of Lords. President of the Royal Society, Lord Rees of Ludlow is

also Master of Trinity College, Cambridge University, and Astronomer Royal. The address by Lord Rees, in full, was as follows:

Last year, Brent Scowcroft stood at this podium as Ditchley Lecturer. It's daunting to follow him. I'll take as my text his concluding words:

"If we behave wisely, prudently and in close strategic cooperation with each other, the 21st century could be the best yet in the rather dismal history of mankind."

This is the 50th anniversary of the Ditchley Foundation, and I've been asked to offer a scientist's perspective on the next fifty years. As an astronomer, I often get mistakenly described as an astrologer—but I cast no horoscopes and have no crystal ball. My message will be that the Promethean power of science offers greater opportunities than ever before—for the developing and the developed world. We can indeed be optimistic: we can surely expect huge economic and social advances, especially in Asia. But there will be new challenges and vulnerabilities to contend with.

THE LAST 50 YEARS

Fifty years ago no-one here could confidently have predicted the geopolitical landscape of today. And scientific forecasting is just as hazardous. Three of today's most remarkable technologies had their gestation in the 1950s. But nobody could then have guessed how pervasively they would shape our lives today.

It was in 1958 that Jack Kilby of Texas Instruments and Robert Noyce of Fairchild Semiconductors built the first integrated circuit—the precursor of today's ubiquitous silicon chips, each containing literally billions of microscopic circuit elements. This was perhaps the most transformative single invention of the past century.

A second technology with huge potential began in Cambridge in the 1950s, when Watson and Crick discovered the bedrock mechanism of heredity—the famous double helix. This discovery launched the science of molecular biology, opening exciting prospects in genomics and synthetic biology.

And it's just over 50 years since the launch of Sputnik. This event started the 'space race', and led President Kennedy to inaugurate the programme to land men on the Moon. Kennedy's prime motive was of course superpower rivalry—cynics could deride it as a stunt. But it was an extraordinary technical triumph—especially as NASA's total computing power was far less than in a single mobile phone today. And it had an inspirational aspect too: it offered a new perspective on our planet. Distant images of Earth—its delicate biosphere of clouds, land and oceans contrasting with the sterile moon-landscape where the astronauts left their footprints—have, ever since the 1960s, been iconic for environmentalists.

Most of us here are old enough to recall the Apollo programme. But it's nearly 40 years since Neil Armstrong's 'first small step'. To young people today, however, this is ancient history: they know that the Americans went to the Moon, just as they know the Egyptians built pyramids, but the motives for these two enterprises may seem equally baffling.

There was no real follow-on after Apollo: there is no practical or scientific motive adequate to justify the huge expense of NASA-style manned spaceflight, and it has lost its glamour. But unmanned space technology has flourished, giving us GPS, global communications, environmental monitoring and other everyday benefits, as well as an immense scientific yield. But of course there is a dark side. Its initial motivation was to

provide missiles to carry nuclear weapons. And those weapons were themselves the outcome of a huge enterprise, the Manhattan project, that was even more intense and focused than the Apollo programme.

Soon after World War II, some physicists who had been involved in the Manhattan project founded a journal called the *Bulletin of Atomic Scientists*, aimed at promoting arms control. The 'logo' on the *Bulletin's* cover is a clock, the closeness of whose hands to midnight indicates the Editorial Board's judgement on how precarious the world situation is. Every year or two, the minute hand is shifted, either forwards or backwards.

It was closest to midnight at the time of the Cuban Missile Crisis. Robert MacNamara spoke frankly about that episode in his confessional movie 'Fog of War'. He said that "We came within a hairbreadth of nuclear war without realising it. It's no credit to us that we escaped—Khrushchev and Kennedy were lucky as well as wise". Indeed on several occasions during the Cold War the superpowers could have stumbled towards armageddon.

When the Cold War ended, the *Bulletin's* clock was put back to 17 minutes to midnight. There is now far less risk of tens of thousands of H-bombs devastating our civilisation. Indeed one clear reason for sharing Brent Scowcroft's optimism is that the greatest peril to confront the world from the 1950s to the 1980s—massive nuclear annihilation—has diminished.

But the clock has been creeping forward again. There is increasing concern about nuclear proliferation, and about nuclear weapons being deployed in a localised conflict. And Al Qaida-style terrorists might some day acquire a nuclear weapon. If they did, they would willingly detonate it in a city, killing tens of thousands along with themselves, and millions would acclaim them as heroes.

And the threat of a global nuclear catastrophe could be merely in temporary abeyance. I'm diffident about even mentioning such matters to an audience where there's so much experience and expertise. But during this century, geopolitical realignments could be as drastic as those during the last century, and could lead to a nuclear standoff between new superpowers that might be handled less well—or less luckily—than the Cuba crisis was.

The nuclear age inaugurated an era when humans could threaten the entire Earth's future—what some have called the 'anthropocene' era. We'll never be completely rid of the nuclear threat. But the 21st century confronts us with new perils as grave as the bomb. They may not threaten a sudden world-wide catastrophe—the doomsday clock is not such a good metaphor—but they are, in aggregate, worrying and challenging.

I want briefly to address some of these themes, and then, near the end of my lecture, to comment on the role of science and scientists in the policy arena.

ENERGY AND CLIMATE

High on the global agenda are energy supply and energy security. These are crucial for economic and political stability, and linked of course to the grave issue of long-term climate change.

Human actions—mainly the burning of fossil fuels—have already raised the carbon dioxide concentration higher than it's ever been in the last half million years. Moreover, according to 'business as usual' scenarios, it will reach twice the pre-industrial level by 2050, and three times that level later in the century. This much is entirely uncontroversial. Nor is there significant

doubt that CO₂ is a greenhouse gas, and that the higher its concentration rises, the greater the warming—and, more important still, the greater the chance of triggering something grave and irreversible: rising sea levels due to the melting of Greenland's icecap; runaway greenhouse warming due to release of methane in the tundra, and so forth.

There is a substantial uncertainty in just how sensitive the temperature is to the CO₂ level. The climate models can, however, assess the likelihood of a range of temperature rises. It is the 'high-end tail' of the probability distribution that should worry us most—the small probability of a really drastic climatic shift. Climate scientists now aim to refine their calculations, and to address questions like: Where will the flood risks be concentrated? What parts of Africa will suffer severest drought? Where will the worst hurricanes strike?

The 'headline figures' that the climate modellers quote—2, 3 or 5 degrees rise in the mean global temperature—might seem too small to fuss about. But two comments should put them into perspective.

First, even in the depth of the last ice age the mean temperature was lower by just 5 degrees. Second, the prediction isn't a uniform warming: the land warms more than the sea, and high latitudes more than low. Quoting a single figure glosses over shifts in global weather patterns that will be more drastic in some regions than in others, and could involve relatively sudden 'flips' rather than steady changes.

Nations can adapt to some of the adverse effects of warming. But the most vulnerable people—in, for instance, Africa or in Bangladesh—are the least able to adapt.

The science of climate change is intricate. But it's a doddle compared to the economics and politics. Global warming poses a unique political challenge for two reasons. First, the effect is non-localised: the CO₂ emissions from this country have no more effect here than they do in Australia, and vice versa. That means that any credible regime whereby the 'polluter pays' has to be broadly international.

Second, there are long time-lags—it takes decades for the oceans to adjust to a new equilibrium, and centuries for ice-sheets to melt completely. So the main downsides of global warming lie a century or more in the future. Concepts of intergenerational justice then come into play: How should we rate the rights and interests of future generations compared to our own? What discount rate should we apply?

In his influential 2006 report for the UK government, Nicholas Stern argued that equity to future generations renders a 'commercial' discount rate quite inappropriate. Largely on that basis he argues that we should commit substantial resources now, to pre-empt much greater costs in future decades.

There are of course precedents for long-term altruism. Indeed, in discussing the safe disposal of nuclear waste, experts talk with a straight face about what might happen more than 10,000 years from now, thereby implicitly applying a zero discount rate. To concern ourselves with such a remote 'post-human' era might seem bizarre. But all of us can surely empathise at least a century ahead. Especially in Europe, we're mindful of the heritage we owe to centuries past; history will judge us harshly if we discount too heavily what might happen when our grandchildren grow old.

To ensure a better-than-evens chance of avoiding a potentially dangerous 'tipping point'; global CO₂ emissions must, by 2050, be brought down to half the 1990 level. This is the target espoused by the G8. It corresponds to two tons of CO₂ per year from

each person on the planet. For comparison, the current European figure is about 10, and the Chinese level is already 4. To achieve this target without stifling economic growth—to turn around the curve of CO₂ emissions well before 2050—is a huge challenge. The debates last week in Japan indicated the problems—especially how to bring India and China into the frame. The great emerging economies have not caused the present problem, but if they develop in as carbon-intensive a way as ours did, they could swamp and negate any measures taken by the G8 alone.

Realistically, however, there is no chance of reaching this target, nor of achieving real energy security, without drastically new technologies. Though I'm confident that these will have emerged by the second half of the century, the worry is that this may not be soon enough.

Efforts to develop a whole raft of techniques for economising on energy, storing it and generating it by 'clean' or low-carbon methods, deserve a priority and commitment from governments akin to that accorded to the Manhattan project or the Apollo moon landing. Current R and D is far less than the scale and urgency demands. To speed things up, we need a 'shotgun approach'—trying all the options. And we can afford it: the stakes are colossal. The world spends around 7 trillion dollars per year on energy and its infrastructure. The U.S. imports 500 billion dollars worth of oil each year.

I can't think of anything that could do more to attract the brightest and best into science than a strongly proclaimed commitment—led by the U.S. and Europe—to provide clean and sustainable energy for the developing and the developed world.

Even optimists about prospects in solar energy, advanced biofuels, fusion and other renewables have to acknowledge that it will be at least 40 years before they can fully 'take over'. Coal, oil and gas seem set to dominate the world's every-growing energy needs for at least that long. Last year the Chinese built 100 coal-fired power stations. Coal deposits representing a million years' accumulation of primeval forest are now being burnt in a single year.

Coal is the most 'inefficient' fossil fuel in terms of energy generated per unit of carbon released. Annual CO₂ emissions are rising year by year. Unless this rising curve can be turned around sooner, the atmospheric concentration will irrevocably reach a threatening level.

So an immediate priority has to be a co-ordinated international effort to develop carbon capture and storage—CCS. Carbon from power stations must be captured before it escapes in the atmosphere; and then piped to some geological formation where it can be stored without leaking out. It's crucial to agree a timetable, and a coordinated plan for the construction of CCS demonstration plants to explore all variants of the technology. To jump-start such a programme would need up to 10 billion dollars a year of public funding worldwide (preferably as part of public-private partnerships). But this is a small price to pay for bringing forward, by five years or more, the time when CCS can be widely adopted and the graph of CO₂ emissions turned around.

What is the role of nuclear power in all this? The concerns are well known—it is an issue where expert and lay opinions are equally divided. I'm myself in favour of the UK and the U.S. having at least a replacement generation of power stations—and of R and D into new kinds of reactors. But the non-proliferation regime is fragile, and before being relaxed about a world-wide programme of nuclear power, one would surely require the kind of fuel bank and leasing ar-

range that has been proposed by Mohamed el Baradei at the IAEA.

NATURAL RESOURCES AND POPULATION

Energy security and climate change are the prime 'threats without enemies' that confront us. But there are others. High among these is the threat to biological diversity caused by rapid changes in land use and deforestation. There have been 5 great extinctions in the geological past; human actions are causing a 6th. The extinction rate is 1000 times higher than normal, and increasing. We are destroying the book of life before we have read it.

Biodiversity—manifested in forests, coral reefs, marine blue waters and all Earth's other ecosystems—is often proclaimed as a crucial component of human wellbeing and economic growth. It manifestly is: we're clearly harmed if fish stocks dwindle to extinction; there are plants whose gene pool might be useful to us. And massive destruction of the rain forests would accelerate global warming. But for environmentalists these 'instrumental'—and anthropocentric—arguments aren't the only compelling ones. For them, preserving the richness of our biosphere has value in its own right, over and above what it means to us humans.

Population growth, of course, aggravates all pressures on energy and environment. Fifty years ago the world population was below 3 billion. It has more than doubled since then, to 6.6 billion. The percentage growth-rate has slowed, but the global figure is projected to reach 8 or even 9 billion by 2050. The excess will almost all be in the developing world.

There is, incidentally, a global trend from rural towards urban living. More than half the world's population is now urban—and megacities are growing explosively.

There is an extensive literature on the 'carrying capacity' of our planet—on how many people it can sustain without irreversible degradation. The answer of course depends on lifestyle. The world could not sustain its present population if everyone lived like present-day Americans or Europeans. On the other hand, the pressures would plainly be eased if people travelled little and interacted via super-internet and virtual reality. And, incidentally, if they were all vegetarians: it takes 13 pounds of corn to make one pound of beef.

If population growth continues even beyond 2050, one can't be other than exceedingly gloomy about the prospects. However, there could be a turnaround. There are now more than 60 countries in which fertility is below replacement level—it's far below in, for instance, Italy and Singapore. In Iran the fertility rate has fallen from 6.5 in 1980 to 2.1 today. We all know the social trends that lead to this demographic transition—declining infant mortality, availability of contraceptive advice, women's education, and so forth.

If the transition quickly extended to all countries, then the global population could start a gradual decline after 2050—a development that would surely be benign.

There is, incidentally, one 'wild card' in all these long-term forecasts. This is the possibility that the average lifespan in advanced countries may be extended drastically by some biomedical breakthrough.

The prognosis is especially bleak in Africa, where there could be a billion more people in 2050 than there are today. It's worth quoting some numbers here. A hundred years ago, the population of Ethiopia was 5 million. It is now 75 million (of whom 8 million need permanent food aid) and will almost double by 2050. Quite apart from the problem of providing services, there is consequent pressure on the water resources of the Nile basin.

Over 200 years ago, Thomas Malthus famously argued that populations would rise until limited by food shortages. His gloomy prognosis has been forestalled by advancing technology, the green revolution and so forth, but he could be tragically vindicated in Africa. Continuing population growth makes it harder to break out of the poverty trap—Africa not only needs more food, but a million more teachers annually, just to keep standards level. And just as today's population couldn't be fed by yesterday's agriculture, a second green revolution may be needed to feed tomorrow's population.

But the rich world has the resources, if the will is there, to enhance the life-chances of the world's billion poorest people—relieving the most extreme poverty, providing clean water, primary education and other basics. This is a precondition of achieving in Africa the demographic tradition that has occurred elsewhere. The overseas aid from most countries, including the U.S., is far below the UN's target of 0.7 percent of GNP. It would surely be shameful, as well as against even our narrow self-interests, if the Millennium Goals set for 2015 were not met.

(To inject a pessimistic note in parenthesis, the meagre underfunding of overseas aid, even in a context where the humanitarian imperative seems so clear, augurs badly for the actual implementation of the measures needed to meet the 2050 carbon emission targets—generally quoted as around 1 percent of GNP—where the payoff is less immediately apparent.)

SOME NEW VULNERABILITIES

Infectious diseases are mainly associated with developing countries—but in our interconnected world we are now all more vulnerable. The spread of epidemics is aggravated by rapid air travel, plus the huge concentrations in megacities with fragile infrastructures.

Whether or not a pandemic gets global grip may hinge on the efficiency of worldwide monitoring—how quickly a Vietnamese or Sudanese poultry farmer can diagnose or report any strange sickness.

In our everyday lives, we have a confused attitude to risk. We fret about tiny risks: carcinogens in food, a one-in-a-million chance of being killed in train crashes, and so forth. But we're in denial about others that should loom much larger. If we apply to pandemics the same prudent analysis that leads us to buy insurance—multiplying probability by consequences—we'd surely conclude that measures to alleviate this kind of extreme event need higher priority. A global pandemic could kill tens of millions and cost many trillions of dollars.

This thought leads me to new vulnerabilities of a different kind: vulnerabilities stemming from the misuse of powerful technologies—either through error or by design. Biotechnology, for instance, holds huge promise for health care, for enhanced food production, even for energy. But there is a downside.

Here's a quote from the American National Academy of Sciences: "Just a few individuals with specialized skills . . . could inexpensively and easily produce a panoply of lethal biological weapons. . . . The deciphering of the human genome sequence and the complete elucidation of numerous pathogen genomes . . . allow science to be misused to create new agents of mass destruction."

Not even an organized network would be required: just a fanatic, or a weirdo with the mindset of those who now design computer viruses—the mindset of an arsonist. The techniques and expertise for bio or cyber attacks will be accessible to millions.

We're kidding ourselves if we think that technical expertise is always allied with balanced rationality: it can be combined with

fanaticism—not just the traditional fundamentalism that we're so mindful of today, but new age irrationalities. I'm thinking of cults such as the Raelians; and of extreme eco-freaks, animal rights campaigners and the like. The global village will have its village idiots.

In a future era of vast individual empowerment, where even one malign act would be too many, how can our open society be safeguarded? Will there be pressures to constrain diversity and individualism? Or to shift the balance between privacy and intrusion? These are stark questions, but I think they are deeply serious ones. (Though—to inject a slightly frivolous comment—the careless abandon with which younger people put their intimate details on Facebook, and the broad acquiescence in ubiquitous CCTV, suggests that in our society there will be surprisingly little resistance to loss of privacy.)

Developments in cyber, bio or nano-technology will open up new risks of error or terror. Our global society is precariously dependent on elaborate networks—electricity grids, air traffic control, the internet, just-in-time delivery and so forth—whose collapse could stress it to breaking point. It's crucial to ensure maximal resilience of all such systems.

At the start of this lecture, I cited three technologies that now pervade our lives in ways quite unenvisioned 50 years ago. Likewise, by extrapolating from the present, I have surely missed the qualitatively greatest changes that may occur in the next 50.

The great science-fiction writer Arthur C. Clark opined that any ultra-advanced technology was indistinguishable from magic. Everyday consumer items like Sony game stations, sat-nav and Google would have seemed magic 50 years ago.

In the coming decades, there could be qualitatively new kinds of change. One thing that's been unaltered for millennia is human nature and human character. But in this century, novel mind-enhancing drugs, genetics, and 'cyberg' techniques may start to alter human beings themselves. That's something qualitatively new in recorded history.

And we should keep our minds open, or at least ajar, to concepts on the fringe of science fiction—robots with many human attributes, computers that make discoveries worthy of Nobel prizes, bioengineered organisms, and so forth. Flaky Californian futurologists aren't always wrong.

Opinion polls in England show that people are generally positive about science's role, but are concerned that it may 'run away' faster than we can properly cope with it. Some commentators on biotech, robotics and nanotech worry that when the genie is out of the bottle, the outcome may be impossible to control. They urge caution in 'pushing the envelope' in some areas of science.

The uses of academic research generally can't be foreseen: Rutherford famously said, in the mid-thirties, that nuclear energy was 'moonshine'; the inventors of lasers didn't foresee that an early application of their work would be to eye surgery; the discoverer of x-rays was not searching for ways to see through flesh. A major scientific discovery is likely to have many applications—some benign, others less so—none of which was foreseen by the original investigator.

We can't reap the benefits of science without accepting some risks—the best we can do is minimize them. Most surgical procedures, even if now routine, were risky and often fatal when they were being pioneered. In the early days of steam, people died when poorly designed boilers exploded.

But something has changed. Most of the 'old' risks were localized. If a boiler explodes, it's horrible but there's an 'upper bound' to just how horrible. In our ever more

interconnected world, there are new risks whose consequences could be so widespread that even a tiny probability is unacceptable.

There will surely be a widening gulf between what science enables us to do, and what applications it's prudent or ethical actually to pursue—more doors that science could open but which are best kept closed.

There are already scientific procedures—human reproductive cloning, synthetic biology and the rest—where regulation is called for, on ethical as well as prudential grounds. And there will be more. Regulations will need to be international, and to contend with commercial pressures—and they may prove as hard to enforce as the drug laws. If one country alone imposed regulations, the most dynamic researchers and enterprising companies would migrate to another that was more permissive. This is happening already, in a small way, in primate and stem cell research.

THE INTERNATIONAL SCIENTIFIC COMMUNITY

Some comments, now, on the role of the scientific community. Science is the only truly global culture: protons, proteins, and Pythagoras's theorem are the same from China to Peru. Research is international, highly networked, and collaborative. And most science-linked policy issues are international, even global—that's certainly true of those I've addressed in this lecture.

This is primarily an Anglo-American gathering, so I hope it's not out of place to emphasize that our two countries have been the most successful in creating and sustaining world-class research universities. These institutions are magnets for talent—both faculty and students—from all over the world, and are in most cases embedded in a 'cluster' of high-tech companies, to symbiotic benefit.

By 2050, China and India should at least gain parity with Europe and the US—they will surely become the 'centre of gravity' of the world's intellectual power. We will need to aim high if we are to sustain our competitive advantage in offering cutting-edge 'value added'.

It's a duty of scientific academies and similar bodies to ensure that policy decisions are based on the best science, even when that science is still uncertain and provisional; this is the Royal Society's role in the UK and that of the National Academy of Sciences in the US. The academies of the G8 + 5 countries are playing an increasing role in highlighting global issues. And one thinks of consortia like the IPCC, and bodies like the WHO.

In this country, an ongoing dialogue with parliamentarians on embryos and stem cells has led to a generally-admired legal framework. On the other hand, the GM crops debate went wrong here because we came in too late, when opinion was already polarized between eco-campaigners on the one side and commercial interests on the other. I think we have recently done better on nanotechnology, by raising the key issues early. It's necessary to engage with the public 'upstream' of any legislation or commercial developments.

We need to point out that the resources and expertise devoted to applications of science are not deployed optimally. Some subjects have had the 'inside track' and gained disproportionate resources; huge sums, for instance, are still devoted to new weaponry. On the other hand, environmental projects, renewable energy, and so forth, deserve more effort. In medicine, the focus is disproportionately on cancer and cardiovascular studies, the ailments that loom largest in prosperous countries, rather than on the infections endemic in the tropics.

Policy decisions—whether about energy, GM technology, mind-enhancing drugs or

whatever—are never solely 'scientific': strategic, economic, social, and ethical ramifications enter as well. And here scientists have no special credentials. Choices on how science is applied shouldn't be made just by scientists. That's why everyone needs a 'feel' for science and a realistic attitude to risk—otherwise public debate won't rise above the level of tabloid slogans.

Scientists nonetheless have a special responsibility. We feel there is something lacking in parents who don't care what happens to their children in adulthood, even though this is largely beyond their control. Likewise, scientists shouldn't be indifferent to the fruits of their ideas—their intellectual creations. They should try to foster benign spin-offs—and of course help to bring their work to market when appropriate. But they should campaign to resist, so far as they can, ethically dubious or threatening applications. And they should be prepared to engage in public debate and discussion.

I mentioned earlier the atomic scientists in World War II. Many of them—and I've been privileged to know some, such as Hans Bethe and Joseph Rotblat—set a fine example. Fate had assigned them a pivotal role in history. They returned with relief to peacetime academic pursuits. But they didn't say that they were 'just scientists' and that the use made of their work was up to politicians. They continued as engaged citizens—promoting efforts to control the power they had helped unleash. We now need such individuals—not just in physics, but across the whole range of applicable science.

A COSMIC PERSPECTIVE

My special subject is astronomy—the study of our environment in the widest conceivable sense. And I'd like to end with a cosmic perspective.

It is surely a cultural deprivation to be unaware of the marvelous vision of nature offered by Darwinism and by modern cosmology—the chain of emergent complexity leading from a still-mysterious beginning to atoms, stars, planets, biospheres and human brains able to ponder the wonder and the mystery. And there's no reason to regard humans as the culmination of this emergent process. Our Sun is less than half way through its life. Any creatures witnessing the Sun's demise, here on earth or far beyond, won't be human—they'll be as different from us as we are from bacteria.

But, even in this cosmic time-perspective—extending billions of years into the future, as well as into the past—this century may be a defining moment. It's the first in our planet's history where one species—ours—has Earth's future in its hands.

I recalled earlier the image of our Earth viewed from space. Suppose some aliens had been watching our planet—a 'pale blue dot' in a vast cosmos, for its entire history, what would they have seen?

Over nearly all that immense time, 4.5 billion years, Earth's appearance would have altered very gradually. The continents drifted; the ice cover waxed and waned; successive species emerged, evolved and became extinct.

But in just a tiny sliver of the Earth's history—the last one millionth part, a few thousand years—the patterns of vegetation altered much faster than before. This signaled the start of agriculture. The changes accelerated as human populations rose.

But then there were other changes, even more abrupt. Within fifty years—little more than one hundredth of a millionth of the Earth's age, the carbon dioxide in the atmosphere began to rise anomalously fast. The planet became an intense emitter of radio waves (the total output from all TV, cellphone and radar transmissions).

And something else unprecedented happened: small projectiles lifted from the planet's surface and escaped the biosphere completely. Some were propelled into orbits around the Earth; some journeyed to the Moon and planets.

If they understood astrophysics, the aliens could confidently predict that the biosphere would face doom in a few billion years when the Sun flares up and dies. But could they have predicted this unprecedented spike less than half way through the Earth's life—these human-induced alterations occupying, overall, less than a millionth of the elapsed lifetime and seemingly occurring with runaway speed?

If they continued to keep watch, what might these hypothetical aliens witness in the next hundred years? Will a final spasm be followed by silence? Or will the planet itself stabilize? And will some of the objects launched from the Earth spawn new oases of life elsewhere?

The answers will depend on us, collectively—on whether we can, to quote Brent Scowcroft again, 'behave wisely, prudently.' •

TRIBUTE TO SERGEANT PEYTON WILLIAMS

• Mr. SESSIONS. Mr. President, today I pay tribute to SGT Peyton Williams, a constituent of mine from Wetumpka, AL. Sergeant Williams was selected as the Marine of the Year for the Second Marine Division. Out of the over 20,000 marines who comprise the Second Division, Sergeant Williams was selected for his outstanding performance in Operation Iraqi Freedom, OIF. This prestigious award signifies that Sergeant Williams represents the best of what a U.S. Marine should be.

Later this month, Governor Bob Riley will proclaim August 21, 2008, as Sergeant Peyton Williams Day in the State of Alabama. I would like to express my pride in his accomplishment, and appreciation for his service to our Nation in Iraq. Sergeant Williams contributed to the success of the counter-insurgency in the Al Anbar province. His work there was critical to our success in our current operations and he serves as an example to his fellow marines and an inspiration to all young Alabamians who will follow him in service as members of the military.

According to his company commander, CPT Brian Cillessen, "Peyton has more talent by accident than most Marines learn in a career. He is a great American who has served his country well, and I am proud to have the honor to serve with him and would welcome the opportunity in the future."

I would like to echo Captain Cillessen's praise of Sergeant Williams, it is Marines like him who have ensured the success of the surge strategy. I believe that with dedicated marines like Sergeant Williams in the force, victory is not only possible in our current operations in Iraq, it is certain.

And so, I applaud Sergeant Williams' hard work, and I look forward to hearing more great things about this fine son of Alabama. •

TRIBUTE TO THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

• Mr. SESSIONS. Mr. President, today I recognize the University of Alabama at Birmingham, UAB, a place known for its outstanding, world-renowned HIV/AIDS research and treatment. Dr. Michael Saag directs the Center for AIDS Research at UAB, which was established in 1988 by the National Institute for Allergy and Infectious Diseases to stimulate research and scientific advancement concerning AIDS and HIV. This program was initiated in 1998 and currently includes 20 centers funded through a consortium of six National Institutes of Health. Under Dr. Saag's exceptional leadership, the UAB Center for AIDS Research has grown dramatically as shown by its increase in total research funding, from \$2.9 million dollars in 1988 to over \$90 million currently.

UAB has a remarkable program in Zambia, the Center for Infectious Disease Research, headed up by Dr. Jeff Stringer. The UAB Zambia program, which receives funding through the President's Emergency Program for AIDS Relief, PEPFAR, is treating over 170,000 patients, with up to 100,000 patients on ARV treatment.

Dr. Stringer and his remarkable team have also worked vigorously with the Zambian Government to deliver "prevention of mother-to-child HIV transmission" services to over 500,000 women in Zambia, preventing tens of thousands of infants from being born with HIV. The UAB HIV prevention and treatment service units support 175 public health facilities in four of the nine provinces of Zambia. Prevention of mother-to-child transmission services are offered in 154 clinics and hospitals.

HIV care and treatment services are offered in 46 sites, and include a comprehensive cervical cancer screening program that has screened over 5,000 women in its first year. Research has shown a direct connection between HIV and cervical cancer among women, and groundbreaking work in the field has demonstrated the importance of screening HIV-infected women for cervical cancer, especially in resource-poor countries of the world. Dr. Groesbeck Parham and his group from UAB/ CIDRZ, using PEPFAR resources, have led the way in creating mechanisms to screen large numbers of women in Zambia, saving thousands of lives.

The UAB Zambia program also provides HIV testing to TB patients, and TB screening for all HIV patients in a comprehensive, integrated TB/HIV initiative.

I applaud the fine work UAB is doing, and I know that their service has saved thousands of lives. This is a prime example of the clear, positive results we have seen come about through PEPFAR, and one major reason I worked to ensure that new PEPFAR legislation preserves the focus on treatment that has undoubtedly contributed to its success.

I am proud of the role UAB has played on an international level in striving to provide top-notch treatment, as well as research to continuously improve on that treatment for Alabama, the nation, and the world, over the past 20 years. •

HONORING DR. EPHRAIM ZUROFF

• Mr. SMITH. Mr. President, I rise today to commend Dr. Ephraim Zuroff and the Simon Wiesenthal Center for their efforts to track down the last Nazi war criminals from World War II. Their work is enormously important, both in bringing the guilty to justice and preventing future acts of genocide. The statute of limitations does not, must not, expire on crimes against humanity. Earlier this year, I introduced the World War II War Crimes Accountability Act with Senator NELSON, which I hope will help Dr. Zuroff and the Simon Wiesenthal Center in their noble effort.

One of the main targets of this effort is Sandor Kepiro, who is charged with the 1942 killing of about 1,000 Jews, Gypsies, and Serbs in Novi Sad, Serbia. Kepiro allegedly committed these crimes while serving as a Hungarian police captain during World War II. He was convicted in 1944, but the verdict was annulled when the Nazis invaded Hungary. He was convicted again in 1946, in absentia, but escaped before serving his sentence. In 2007, a Hungarian court ruled that Kepiro could not be charged again for his alleged crimes. He is now living in Hungary, and the government continues to investigate the circumstances of his WWII activities. The Hungarian government must summon the political will to bring Kepiro to justice. Inaction is not an option.

The Simon Wiesenthal Center launched Operation: Last Chance in 2002, to identify and assist in the prosecution of the remaining Nazi war criminals still at large. Dr. Zuroff, who has been leading this effort, should be highly commended for his outstanding efforts in bringing the most guilty Nazis to justice. Of these, Kepiro is near the top of his list.

Even today, the crimes of people like Kepiro in the service of pro-Nazi regimes strain our understanding of hate. National Socialist Germany today is an icon remembered only for its brutality, its mantra of genocide, and its culture of racism. And those last Nazis, who are waiting out their last days under the coming twilight, must not be allowed to go quietly into the night, as did too many of their victims. For the souls that were lost, and even more for those that remain, there must be justice. I commend Dr. Zuroff and the Simon Wiesenthal Center in the highest possible terms, and urge the United States Government to do all it can to help them in their cause. •